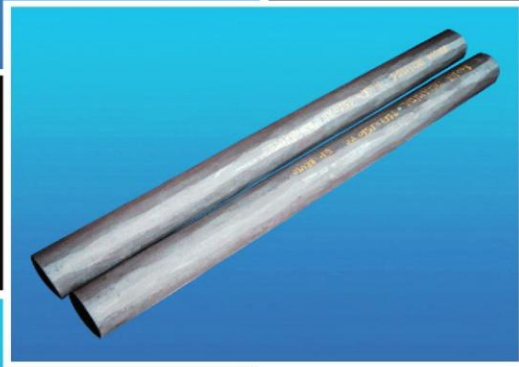


FORGED BARS

PETROCHEMICAL •
CHEMICAL •
MECHANIC •
FERTILIZERS •
SIDERURGY •



Applications

- Pump axles, pins, screws, nuts, ...
- Safety valves components.
- Weldolets.
- Axles and other computer components.
- Measuring and control devices components.
- Nuclear mills components.

Some customers

ABB Lummus, ASTM, Braskem, Canberra, Copesp, Crosby, Cameron, Dresser, Flowserve, Fosfértil, Hiter, Iope, Metroval, Multialloy, Netzsch, Petrobras, Petroquímica União, Políteno, Rhodia, Selas-Linde, Spirax Sarco, Tecval, Valtek, ...

CHEMICAL COMPOSITION, MECHANIC CHARACTERISTICS AND FORGED ALLOY APPLICATIONS

| Type | Engemasa | Similar ASTM | C | Mn | Si | P | S | Cr | Ni | Mo | Others | LR (MPa) | LE (MPa) | A (%) | E (%) | |
|--------------------------------|--|--------------------------|-----------|---------|---------|-------|-----------|-----------|-----------------|-----------|--|---------------------------------|----------|-------|-------|----|
| Stainless Steel | Engevac 304L | A182 F304L | 0,03 | 2,00 | 1,00 | 0,045 | 0,03 | 18,0-20,0 | 8,0-13,0 | -- | -- | 485 | 170 | 30 | 50 | |
| | Engevac 316L | A182 F316L | 0,03 | 2,00 | 1,00 | 0,045 | 0,03 | 16,0-18,0 | 10,0-15,0 | 2,0-3,0 | -- | 485 | 170 | 30 | 50 | |
| | Engevac 317L | A182 F317L | 0,03 | 2,00 | 1,00 | 0,045 | 0,03 | 18,0-20,0 | 11,0-15,0 | 3,0-4,0 | -- | 485 | 170 | 30 | 50 | |
| | Engevac 17-4-PH Cond H1150 | A705 Tp 630 UNS 17400 | 0,07 | 1,00 | 1,00 | 0,04 | 0,03 | 15,5-17,5 | 3,0-5,0 | -- | -- | Cu: 3,0-5,0 Nb+Ta: 0,15-0,45 | 930 | 725 | 16 | 50 |
| | Engevac F317 | A182 | 0,08 | 2,00 | 1,00 | 0,045 | 0,03 | 18,0-20,0 | 11,0-15,0 | 3,0-4,0 | -- | -- | 515 | 205 | 30 | 50 |
| | Engevac F321 | A182 | 0,08 | 2,00 | 1,00 | 0,045 | 0,03 | 17,0-19,0 | 9,0-12,0 | -- | -- | -- | 515 | 205 | 30 | 50 |
| Engevac F347 | A182 | 0,08 | 2,00 | 1,00 | 0,045 | 0,03 | 17,0-20,0 | 9,0-13,0 | -- | -- | -- | 515 | 205 | 30 | 50 | |
| Corrosion | Engevac 20 | B473 UNS N08020 | 0,07 | 2,00 | 1,00 | 0,045 | 0,035 | 19,0-21,0 | 32,0-38,0 | 2,0-3,0 | Cu: 3,0-4,0 Nb: 1,0 max | 551 | 241 | 30 | 50 | |
| | Engevac 200 | B160 UNS N02200 | 0,15 | 0,35 | 0,35 | -- | 0,01 | -- | 99,0 min (b) | -- | Cu: 0,25 max Fe: 0,40 max | 380 | 105 | 40 | -- | |
| | Engevac 400 | B164 UNS N04400 | 0,30 | 2,00 | 0,50 | -- | 0,02 | -- | 63,0 min (b) | -- | Cu: 28,0-34,0 Fe: 2,5 max | 480 | 170 | 35 | -- | |
| | Engevac K500 (Aged) Similar: MONEL K500 | -- | 0,25 | 1,50 | 0,50 | -- | 0,01 | -- | 63,0 min (b) | -- | Cu: 27,0-33,0 Fe: 2,00 max Al: 2,30-3,15 Ti: 0,35-0,85 | 883 up to 1177 | 589 | 35 | 20 | |
| High Temperature and Corrosion | Engevac 600 | B166 UNS N06600 | 0,15 | 1,00 | 0,50 | -- | 0,015 | 14,0-17,0 | 72,0 min (b) | -- | Fe: 6,0-10,0 Cu: 0,50 max | 550 | 240 | 30 | -- | |
| | Engevac 625 | B444 UNS N06625 | 0,10 | 0,50 | 0,50 | 0,015 | 0,015 | 20,0-23,0 | 58,0 min | 8,0-10,0 | Fe: 5,0 max Nb+Ta: 3,15-4,15 Al: 0,40 max Ti: 0,40 max Co: 1,0 max | 690 | 276 | 30 | -- | |
| | Engevac B-2 | B335 UNS N10665 | 0,020 | 1,00 | 0,10 | 0,04 | 0,030 | 1,00 | Remainder | 26,0-30,0 | Fe: 2,0 max Co: 1,0 max | 760 | 350 | 40 | -- | |
| | Engevac C-4 | B574 UNS N06455 | 0,015 | 1,00 | 0,08 | 0,04 | 0,030 | 14,0-18,0 | Remainder | 14,0-17,0 | Fe: 3,0 max Co: 2,0 max Ti: 0,70 max | 690 | 276 | 40 | -- | |
| | Engevac C-22 | B574 UNS N06022 | 0,015 | 0,50 | 0,08 | 0,02 | 0,020 | 20,0-22,5 | Remainder | 12,5-14,5 | Fe: 2,0-6,0 W: 2,5-3,5 Co: 2,5 V: 0,35 | 690 | 310 | 45 | -- | |
| | Engevac 800 | B408 UNS N08800 | 0,10 | 1,50 | 1,00 | 0,03 | 0,015 | 19,0-23,0 | 30,0-35,0 | -- | Fe: 39,5 max Cu: 0,75 max Al: 0,15-0,60 Ti: 0,15-0,60 | 550 | 240 | 25 | -- | |
| | Engevac 825 | B425 UNS N08825 | 0,05 | 1,00 | 0,5 | 0,03 | 0,030 | 19,5-23,5 | 38,0-46,0 | 2,5-3,5 | Fe: 22 min Cu: 1,5-3,0 Ti: 0,6-1,2 Al: 0,2 max | 586 | 241 | 30 | -- | |
| General Use | Engevac F5 | A182 | 0,15 | 0,3-0,6 | 0,5 | 0,03 | 0,03 | 4,0-6,0 | 0,5 | 0,44-0,65 | -- | 485 | 275 | 20 | 35 | |
| | Engevac F5a | A182 | 0,25 | 0,6 | 0,5 | 0,04 | 0,03 | 4,0-6,0 | 0,5 | 0,44-0,65 | -- | 620 | 450 | 22 | 50 | |
| | Engevac F91 | A182 | 0,08-0,12 | 0,3-0,6 | 0,2-0,5 | 0,02 | 0,01 | 8,0-9,5 | 0,4 | 0,85-1,05 | Cb: 0,06-0,1 N: 0,03-0,07 Al: 0,04 max V: 0,18-0,25 | 585 | 415 | 20 | 40 | |
| | Engevac F11 CL 1 | A182 | 0,05-0,15 | 0,3-0,6 | 0,5-1,0 | 0,03 | 0,03 | 1,0-1,5 | -- | 0,44-0,65 | -- | 415 | 205 | 20 | 45 | |
| | Engevac F12 CL 1 | A182 | 0,05-0,15 | 0,3-0,6 | 0,5 | 0,045 | 0,045 | 0,80-1,25 | -- | 0,44-0,65 | -- | 415 | 220 | 20 | 45 | |
| | Engevac F22 CL 1 | A182 | 0,05-0,15 | 0,3-0,6 | 0,5 | 0,04 | 0,04 | 2,0-2,5 | -- | 0,87-1,13 | -- | 415 | 205 | 20 | 35 | |
| | Engevac F6a CL 1 | A182 | 0,15 | 1,00 | 1,00 | 0,04 | 0,03 | 11,5-13,5 | 0,5 | -- | -- | 485 | 275 | 18 | 35 | |
| | Engevac F6a CL 2 | A182 | 0,15 | 1,00 | 1,00 | 0,04 | 0,03 | 11,5-13,5 | 0,5 | -- | -- | 585 | 380 | 18 | 35 | |
| | Engevac F51 | A182 | 0,03 | 2,00 | 1,00 | 0,03 | 0,02 | 21,0-23,0 | 4,5-6,5 | 2,5-3,5 | N: 0,08-0,2 | 620 | 450 | 25 | 45 | |
| | Engevac F53 | A182 | 0,03 | 1,20 | 0,8 | 0,035 | 0,02 | 24,0-26,0 | 6,0-8,0 | 3,0-5,0 | N: 0,24-0,32 Cu: 0,5 max | 800 | 550 | 15 | -- | |
| | Engevac F55 | A182 | 0,03 | 1,00 | 1,00 | 0,03 | 0,01 | 24,0-26,0 | 6,0-8,0 | 3,0-4,0 | N: 0,2-0,3 Cu: 0,5-1,0 W: 0,5-1,0 | 750 up to 895 | 550 | 25 | 45 | |
| Engevac F6NM | A182 | 0,05 | 0,5-1,0 | 0,6 | 0,03 | 0,03 | 11,5-14,0 | 3,5-5,5 | 0,5-1,0 | -- | 790 | 620 | 15 | 45 | | |

Notes:

- (a) The values indicated above are maximum, unless indicated in opposite.
- (b) The values include % Co.
- (c) Engevac is a registered trade-mark of Engemasa Engenharia e Materiais Ltda.

References:

- 1) Handbook of stainless steel (D. Parker & I.M. Bernstein)
- 2) Metals Handbook - Vol. 3 - Ninth Edition ASM.
- 3) Annual Book of ASTM Standards - Parts 1 and 2.